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Burrowing Owl Population Trends on the Kininvie Blocks from 1993-2007, and Ancillary Data for Additional Species at Risk in 2007

Alberta Species at Risk Report No. 116

Alberta

Burrowing Owl Population Trends on the Kininvie Blocks from 1993-2007, and Ancillary Data for Additional Species at Risk in 2007

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Alberta Species at Risk Report No. 116
February 2008

Alberta
Sustainable Resource Development

Publication No.:
ISBN: 978-0-7785-6555-5 (Printed Edition)
ISBN: 978-0-7785-6556-7 (On-line Edition)
ISSN: 1496-7219 (Printed Edition)
ISSN: 1496-7146 (On-line Edition)

Cover illustration: G.Court

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This publication may be cited as:

Stevens, S.D., and A.W. Todd. 2008. Burrowing Owl Population Trends on the Kininvie Blocks from 1993-2007, and Ancillary Data for Additional Species at Risk in 2007. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 116, Edmonton, AB. 12 pp.

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ACKNOWLEDGEMENTS

The 2007 trend block survey was conducted by Lisa Matthias, Cindy Platt, Scott Stevens, and Pat Young (Alberta Sustainable Resource Development, Fish and Wildlife Division). The authors express thanks to: the Eastern Irrigation District for allowing access to their lands; the survey participants; Troy Wellicome (Environment Canada) for loaning wildlife callers with burrowing owl calls; Reg Russell (Alberta Sustainable Resource Development, Fish and Wildlife Division), Cindy Platt and Lisa Matthias for manuscript reviews; Don Page (Resource Information Unit, Alberta Sustainable Resource Development), for providing GIS support. We also thank Steve Brechtel and Trevor Rhodes (Alberta Sustainable Resource Development, Fish and Wildlife Division) for encouraging the survey and contributing funding.

EXECUTIVE SUMMARY

Declining populations of burrowing owls in both Canada and Alberta have led to status designations of *Endangered*, both nationally and provincially. Alberta's Burrowing Owl Recovery Team published a ministerial-approved provincial recovery plan in 2005. The plan recommends continuing the provincial burrowing owl monitoring program in the 160 quarter sections of primarily native prairie in the Eastern Irrigation District, east and south of Brooks, collectively known as the Kininvie Blocks (herein, K-blocks).

Burrowing owl nest density has been indexed in the K-blocks 11 of the 15 years spanning 1993-2007, with the most recent surveys completed in 2007. Survey techniques remained consistent, to ensure a valid index of year-to-year trends. Declines in nest density have been recorded consistently since 1997. Observations in 2007 reconfirm and extend that declining trend; only two active burrowing owl nests were located, which equates to a decline of more than 86% in the last ten years, and a 60% decline since 2004, the year of the most recent, preceding survey. This report documents burrowing owl nest density from 1993-2007, and includes descriptions of nest sites located in 2007.

Given the migratory nature of burrowing owls, factors which contribute to their decline may be occurring in the wintering areas and on migration routes outside of Alberta. Within the context of local populations in the K-blocks, and with diminishing sample sizes, it is difficult to assess factors contributing to the decline. Nonetheless, it is possible that cumulative effects from the oil and gas sector, and other human activities (such as increased vehicular traffic) could be playing a role in the decline by affecting adult survival or nesting success. Further, additions to the prairie landscape such as fences, utility poles, and artificial nests for hawks have enhanced habitat quality for those raptors and may be increasing predation on burrowing owls. To illustrate, the 2007 survey showed that other raptors, particularly northern harriers, are common on the K-blocks and four of seven artificial nest platforms contained active ferruginous hawk nests.

This report also includes observations of other bird species listed provincially as *At Risk*, *May be At Risk*, or *Sensitive*, recorded during this survey. Although status listings may have changed somewhat over the years, the species recorded are consistent with the standard protocol for the methods employed in the survey. This is the first time that such ancillary data have been reported from the survey on the trend blocks. Baird's sparrow and Sprague's pipit were both common and abundant on the survey; ferruginous hawks, northern harriers, Swainson's hawks, short-eared owls, loggerhead shrikes, long-billed curlews, and upland sandpipers were also observed. Ancillary data on these other species further illustrate the high value of periodic monitoring on the K-blocks.

1.0 INTRODUCTION

The burrowing owl (*Athene cunicularia*) is a small owl, weighing 125-235 g, which lives up to nine years in the wild (Klimkiewicz 2002). The western sub-species (*Athene cunicularia hypugea*) that occurs in Alberta is migratory, spending the winter as far south as Texas and Central Mexico (Alberta Sustainable Resource Development and Alberta Conservation Association 2005; henceforth ASRD 2005). Burrowing owls arrive in Alberta between early April and mid-May and depart for the south beginning in late August (Haug et al. 1993). Pairs typically nest in burrows provided by Richardson's ground squirrels (*Spermophilus richardsonii*) or badgers (*Taxidea taxus*), but will occasionally use dens of coyote (*Canis latrans*) or fox (*Vulpes spp.*) (ASRD 2005). Females lay clutches averaging 9 eggs (Wellicome 2000) between late April and late May (Todd and Skilnick 2003). Young are capable of sustained flight at 40 days old and become independent in another 20 to 30 days (Todd 2001). In Alberta, nests are generally found on flat to undulating native pasture in the Mixedgrass and Dry Mixedgrass subregions of the Grassland Natural Region (Alberta Natural Heritage Information Centre 2004). Burrowing owls feed primarily on deer mice (*Peromyscus maniculatus*), meadow voles (*microtus pennsylvanicus*), sagebrush voles (*Lemmiscus curtatus*), grasshoppers, and other insects (Poulin 2003).

Over the past few decades, there have been widespread concerns about continuing declines of North American burrowing owl populations; the majority of jurisdictions within the burrowing owl's range give it special status (Haug et al. 1993, Holroyd et al. 2001, ASRD 2005). Although only 4% of the range of the western burrowing owl occurs in Canada, its breeding range has been reduced in Alberta and Saskatchewan, and it has been extirpated in British Columbia and Manitoba (ASRD 2005). In Alberta, the breeding range has decreased 44% in the last 30 years (ASRD 2005). Burrowing owls are classified as *Endangered* under Alberta's *Wildlife Act*. They are also nationally listed as *Endangered* (COSEWIC 2004).

Two areas in Alberta have been surveyed specifically for burrowing owls since the early 1990s as part of a provincial monitoring program. The Hanna trend blocks (herein, H-blocks) were established in 1991, and consist of 109 quarter sections (70.6 km^2) of pasture and cultivated land in the general vicinity of the town of Hanna. Surveys carried out in the H-blocks during eight of the past 16 years showed a precipitous decline in the number of burrowing owls between 1991-1997, with numbers remaining very low in all subsequent years (Kissner and Skiftun 2004). The second monitoring area, the Kininvie blocks (K-blocks), was established in 1993, and encompasses 160 quarter sections (103.6 km^2) located south and east of the town of Brooks. Including 2007, the K-blocks have been surveyed 11 of the past 15 years. Scobie (2002), Russell (2002), and Shyry (2004) all reported a continued decline in the number of burrowing owls occupying the K-blocks.

Here we report burrowing owl nest density observed in the K-blocks in 2007, compare that finding to previous surveys, and discuss possible reasons for burrowing owl population trends in the blocks. Although the survey protocol used in this study (Schmutz

1994) is designed to monitor burrowing owl nest density within the blocks, we also report observations of other bird species listed provincially as *At Risk*, *May be At Risk*, or *Sensitive*, in order to begin to assess the importance of the K-blocks to other rare species of grassland birds.

2.0 STUDY AREA

The ten K-blocks, roughly staggered in a southerly direction, are located south and east of Brooks (Figure 1) on land owned by the Eastern Irrigation District (EID) within the County of Newell, in southeastern Alberta. Each is comprised of 16 adjacent quarter sections of dry mixed grass prairie. The habitat is primarily undulating native rangelands dominated by *Stipa-Bouteloua-Agropyron* vegetation communities (Strong 1992, Russell 2002). Ephemeral wetlands are abundant, with permanent wetlands also occurring. Oil and gas activities are common and widespread in the study area.

3.0 METHODS

All four observers were experienced in the visual and auditory identification of burrowing owls and other target species. The crew of four worked in two pairs; each pair was provided with maps for access to K-blocks, and geographic coordinates (UTM, NAD 83) for the center of each quarter section within the block. All terrain vehicles (ATVs) were used to access quarter section centers and handheld Garmin® GPS 76Cx or 12XL assisted navigation to center coordinates. Elevated points within 200m of the quarter section centers were chosen for best visibility.

Based on terrain, observers would separate by roughly 200m and conduct point count surveys. Each individual conducted a five minute passive scan, while making a 360° pan of the quarter section using binoculars and listening to identify target species. We then broadcasted recorded breeding calls of an adult male burrowing owl (Foxpro™ digital wildlife caller) while scanning for an additional five minutes. The caller was placed above the cargo box on the ATV and the speaker rotated equally in each direction. Burrowing owl calls did not influence detection of other target species since a passive scan was first employed. Further, the call itself did not seem to affect the presence and detection of other species (see also Stevens and Wellicome 2005).

Surveys, which began at approximately 0600 and were completed by 1500, were not conducted in rain or when wind speeds were greater than approximately 20 km/hr, B-4 on the Beaufort scale. Possible burrowing owl sightings, nests, and roosts were investigated before proceeding to the next quarter section. When adults, but not young, were observed, burrows were recorded as nests if nest material (usually dung), whitewash, prey remains or pellets were present in and around the burrow entrance. Adherence to this established burrowing owl protocol ensured that bias was minimized between observers and years (Russell 2002). Songbirds were identified by their territorial songs during the passive phase of the scan, and all other species by direct observation with binoculars. To avoid double-counting of individual birds, we discussed our observations at the end of each scan to ensure an accurate representation of the quarter section; one

data sheet was shared between observers. Base data for maps was provided by the Spatial Data Warehouse™.

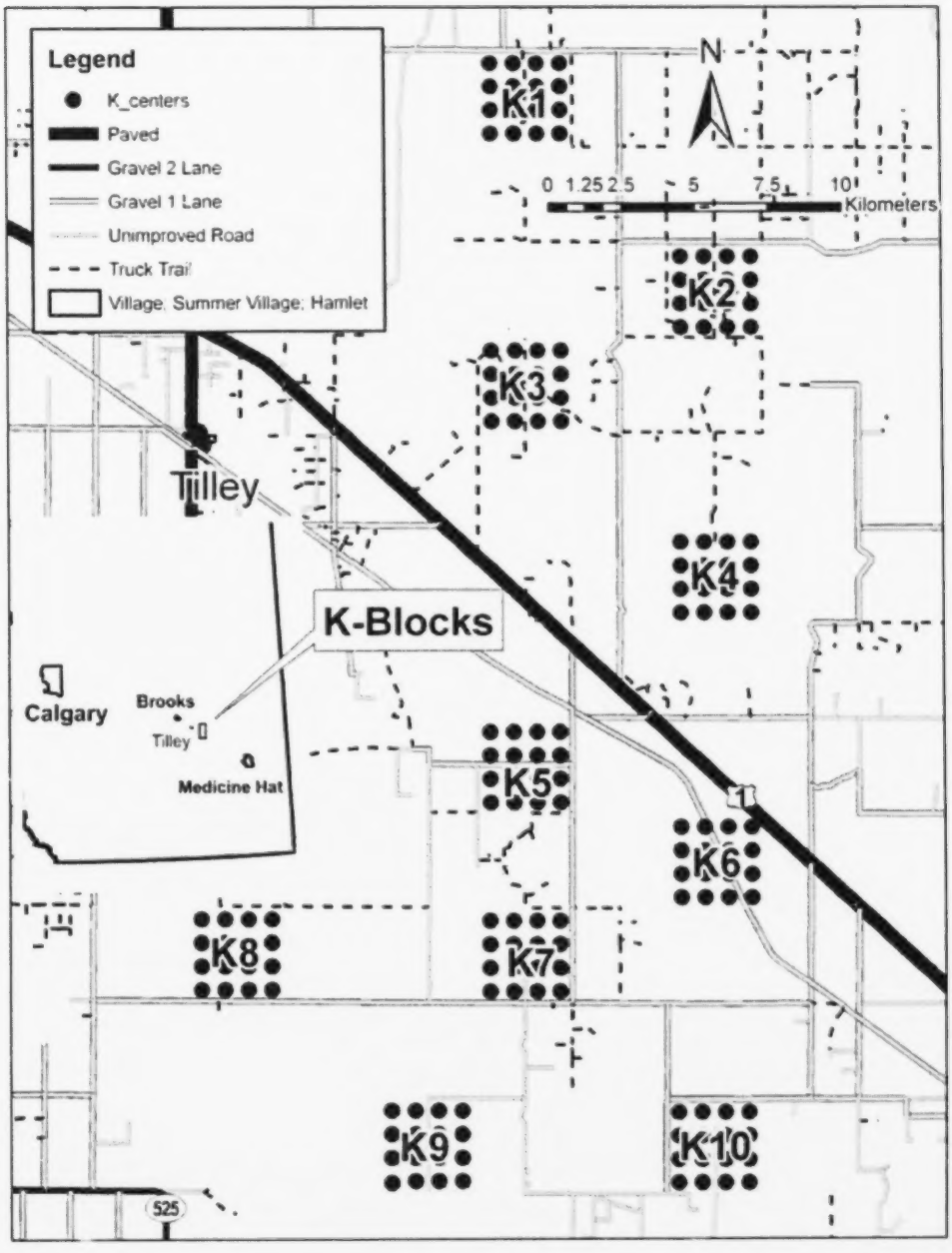

Figure 1. Location of burrowing owl trend blocks (K-blocks).

4.0 RESULTS

4.1. Burrowing Owls

The 2007 K-block survey was conducted June 12-15. All 160 quarter sections were surveyed during that time. Two active burrowing owl nest sites were observed, one in K-3 and one in K-4. Only one adult was observed at the K-3 nest, presumably the male, as it responded to the call broadcast. Numerous pellets and prey feathers occurred around the nest burrow entrance and tunnel, which were lined with vegetation. The burrow was located roughly 20m from a well-head and 40m from a gravel road to a well-site. Both adults were observed at the K-4 nest. Numerous pellets were present and the nest burrow entrance and tunnel were lined with cattle dung. The burrow was located roughly 300m from modified pasture and approximately 2.1 km from the nearest road or trail.

Both nest sites were within 400m of ephemeral wetlands, which were dry at the time of the survey. Further, both sites were situated close to active Richardson's ground squirrel (*Spermophilus richardsonii*) colonies, and in areas of high gas well density (41 and 43 gas wells per quarter section for K-3 and K-4, respectively). An additional burrowing owl site was observed in block K-5 where aged pellets, gray in appearance, were found at a burrow. However, there were no owls observed and we surmise the burrow was used in 2006, likely as a roost, but was unused in 2007.

Nest density in the K-blocks in 2007 was 1.93 nests/100 km^2 (2 nests/103.6 km^2). That density corresponds to a 60% decrease since 2002 and 2004, and an 86% decrease since the maximum observed in 1997 (Figure 2).

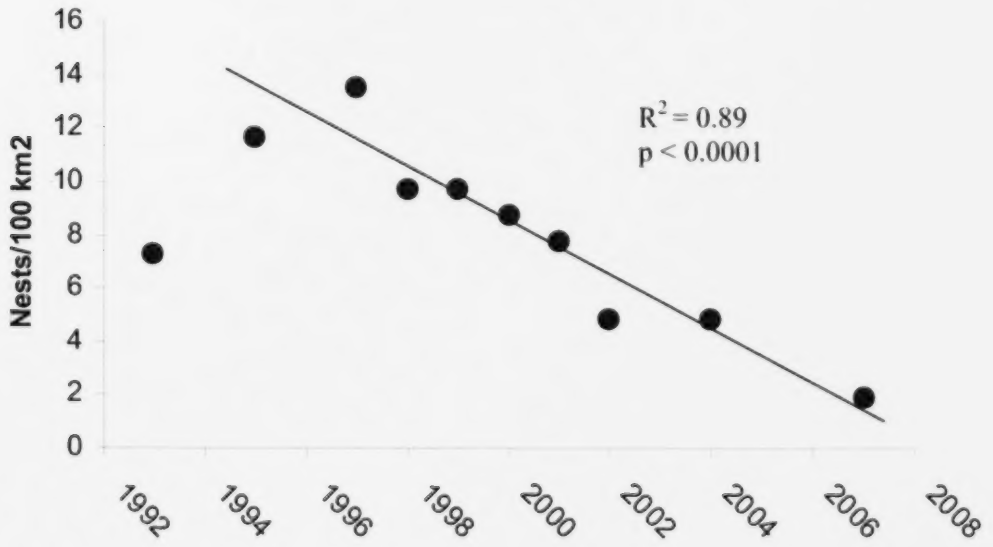

Figure 2. Burrowing owl nest density in the K-blocks from 1993-2007, showing a significant decline of 86% in the past 13 years ($R^2 = 0.89$, $n = 9$, $p < 0.0001$. (Modified from Russell 2002, Shyry 2004, and ASRD 2005).

4.2. Other species observations in 2007

There were 297 observations of bird species listed as *At Risk*, *May be At Risk*, or *Sensitive* (Table 1). Apart from burrowing owls, the only other *At Risk* species observed during the survey was the ferruginous hawk (*Buteo regalis*); other raptors included the short-eared owl (*Asio flammeus*; *May be At Risk*), and Swainson's hawk (*Buteo swainsoni*; *Sensitive*). The northern harrier (*Circus cyaneus*; *Sensitive*) was quite common, occurring in 16% of point counts and 80% of blocks surveyed. By far the most common species encountered was Baird's sparrow (*Ammodramus bairdii*; *May be At Risk*) and Sprague's pipit (*Anthus Spragueii*; *Sensitive*); both occurred in 100% of the blocks surveyed. Other notable species include the upland sandpiper (*Bartramia longicauda*; *Sensitive*) and loggerhead shrike (*Lanius ludovicianus*; *Sensitive*). Long-billed curlew (*Numenius americanus*; *Sensitive*) observations were rare and one American white pelican (*Pelicanus erythrorhynchos*; *Sensitive*) was observed en route to or from feeding grounds.

Table 1. *At Risk*, *May be At Risk*, and *Sensitive* species observations at point count locations and blocks, 2007, depicted as the number of, and percentage of, point counts on which the species was seen, and the percentage of blocks in which the species was observed.

Species	Status[1]	# Point Count	% Point Counts	% Blocks
Burrowing owl	*At Risk*	2	1	20
Ferruginous hawk	*At Risk*	7	4	40
Baird's sparrow	*May be At Risk*	107	67	100
Short-eared owl	*May be At Risk*	4	3	30
American white pelican	*Sensitive*	1	1	10
Loggerhead shrike	*Sensitive*	2	1	10
Long-billed curlew	*Sensitive*	3	2	20
Northern harrier	*Sensitive*	25	16	80
Sprague's pipit	*Sensitive*	142	89	100
Swainson's hawk	*Sensitive*	3	2	30
Upland sandpiper	*Sensitive*	1	1	10

[1] Indicates current general status ranking (ASRD 2007).

5.0 DISCUSSION

5.1. Nest site selection

Burrowing owls tend to forage over areas of tall, dense vegetation such as low-lying emphemeral wetlands (Sissons 2003), likely as a function of higher vole and mice density in such areas (Pouling 2003). Both nest sites observed in our survey were situated near ephemeral wetlands, adding support to that hypothesis and further indicating the high conservation value of these basins. Several authors have reported that burrowing owls select pastures with higher density of ground squirrel burrows (James et al. 1991, Plumpton and Lutz 1993, Desmond and Savidge 1999) in highly grazed areas (Clayton and Schmutz 1999). Overall, grazing pressure appeared light in the K-blocks and ground squirrel colonies rare, both factors which could negatively influence the local settlement and persistence of burrowing owls. Long-term quantitative data are needed to accurately assess grazing regimes and ground squirrel distribution and abundance. Recent stable isotope analysis of feathers taken from burrowing owls nesting in Alberta suggests that 43% return to nest-sites in the same general area as they had occupied the previous summer (Duxbury 2004). That relatively low return rate illustrates the precarious position of the burrowing owl population in and around the K-blocks given the low number of owls that occupy the area.

5.2. Burrowing owl population trends

Data from the K-blocks over the past 13 years (1995-2007) show a highly significant decline of 86% in burrowing owl nest density (which equates to an average annual decline of 15%). This is a higher rate of decline than that indicated by analysis from the North American Breeding Bird Survey for Alberta (11% per year between 1996 and 2003; Sauer et al. 2004). In 1978, the population of burrowing owls in Alberta was estimated at more than 1500 pairs (Wellicome and Haug 1995). The most recent estimate is 200-400 pairs (ASRD 2005), which represents a 73-87% decline in the provincial population since 1978, a value remarkably similar to that documented for the K-blocks, which was over a shorter, more recent period. Further, a landholder index (questionnaire respondents) developed and maintained by Operation Grassland Community (Alberta Fish and Game Association) indicated a 90% decline in burrowing owl numbers from 1991 to 2001, with numbers increasing slightly but remaining very low since 2002 (ASRD 2005). Likewise, intensive surveys in the Hanna area indicated very steep population declines during 1991-1997 (about 90%), with numbers remaining at similar levels since then (ASRD 2005).

Factors which may be contributing to the decline in burrowing populations are many, and include, among others, habitat loss or change; fragmentation (Clayton 1997, Todd 2001); low first-year survival rates (Wellicome 2000); mortality on migration or wintering grounds (ASRD 2005); pesticide application (James and Fox 1987); increased rates of predation (Clayton and Schmutz 1999); and collisions with vehicles (Todd et al. 2003). Within the context of local population declines in the K-blocks, it is difficult to assess which of these are causative factors. Given that the K-blocks are still composed primarily

of native prairie, it is unlikely that either habitat loss or pesticide application is particularly important in influencing local burrowing owl numbers. However, habitat change and cumulative effects from land uses, including oil and gas activities (e.g., increased vehicular traffic and sensory disturbance from drilling operations) could be playing a role in the decline by affecting adult survival or nesting success. While both nest sites in 2007 occurred in areas of high oil and gas activity, it is possible that only the burrowing owls most tolerant (i.e., habituated) to disturbance now remain. Further, additions to the prairie landscape such as fences, utility poles, and artificial nests for hawks have enhanced habitat quality for these other raptors, and may contribute to increased predation on burrowing owls. Indeed, our survey showed that large raptors are common on the K-blocks and seven artificial nest platforms for hawks were observed, four of which contained active ferruginous hawk nests.

5.3. Other Species

Baird's sparrow and Sprague's pipit, listed provincially as *May be At Risk* and *Sensitive*, respectively (ASRD 2007), were by far the most common species we encountered in the K-blocks. Both species prefer native grassland, rarely being found in cultivated fields or where native grasses have been replaced by introduced species (Dale et al. 1997, Robbins and Dale 1999). Although both species can be locally abundant, they have been declining rapidly in parts of their range, with the greatest decline occurring in Canada's prairie-provinces (Sauer et al. 2004). The abundance of Baird's sparrows and Sprague's pipits occurring in the K-blocks indicates that a relatively healthy grassland ecosystem is still in place.

Ferruginous hawks, listed provincially as *Endangered* under the *Alberta Wildlife Act*, occur in large tracts of open, generally arid habitats dominated by grasses or sagebrush (Bechard and Schmutz 1995). This species experienced a dramatic population decline between 1992 and 2000 (Stepnisky et al. 2002), and indications are that trend is continuing (Downy 2005). The presence of four active ferruginous hawk nests, although perhaps a negative influence on burrowing owls, indicates that the K-blocks are somewhat important to this rare species.

Long-billed curlews, listed provincially as *Sensitive*, were observed at only three point counts, despite recent population estimates for Alberta as high as 24,000 (Saunders 2001). The species has been declining in eastern parts of its range in Saskatchewan and has been extirpated in Manitoba (Saunders 2001). The curlew nests close to wetter areas in short-grass or mixed-grassland habitat (Hooper and Pitt 1996) and the K-blocks are situated in an area of high curlew density in the middle of the provincial range (see Hill 1998). Considering this, we expected long-billed curlews to be more common. It is possible that marbled godwits (*Secure*, ASRD 2007), which we found were very common on the blocks (41 observations in 90% of blocks), might be displacing long-billed curlews from the area.

Short-eared owls, loggerhead shrikes, and upland sandpipers were other bird species observed in this survey. Without long-term data, inferences can not be made regarding trends of these other species in the K-blocks.

5.4. Management considerations

Aside from threats faced on their breeding grounds, it is possible that burrowing owl numbers both on a provincial scale and locally in the K-blocks are declining as a result of mortality factors and influences on habitat elsewhere in the continental range (e.g., migration and wintering areas in the U.S. and Mexico). Approaches to deal with those broader concerns are addressed in Canada's National Recovery Strategy (in preparation; Alberta Burrowing Owl Recovery Team 2005). However, it is clear that unless the current population trend is reversed, the burrowing owl is headed towards extirpation from Alberta and from Canada. In Alberta, we can affect survival and productivity of the owls that do return.

Alberta's burrowing owl recovery plan (Burrowing Owl Recovery Team 2005) calls for annual monitoring of the K-blocks. However, we recommend less frequent monitoring of these blocks (e.g., once every five years), considering that the near demise in the Kininvie blocks has now been well documented and reaffirmed. We recommend a continued reliance on the provincial index provided by Operation Grassland Community, supplemented by more local counts on properties held by stewardship cooperators (e.g. MULTISAR), and possibly new inventory initiatives where burrowing owls are presently more common, such as the Cessford-Pollockville and Pakowki Lake areas.

Burrowing owls are species of concern in environmental impact assessments for pipelines and other industrial activities in the province. Pipeline routes and drilling activities are planned so as to avoid burrowing owl nests, and restricted activity dates and setback distance guidelines have been put forward by Alberta Sustainable Resource Development (ASRD 2001), and are in the process of being revised. Another approach that could assist burrowing owl recovery is the implementation and maintenance of heterogeneity in grazing regimes (ASRD 2005). Further, installation of artificial burrows in Saskatchewan has been shown to reduce badger predation (Wellicome et al. 1997) and could be used in Alberta to that purpose. Finally, Operation Burrowing Owl, a non-government organization in Saskatchewan, has placed "burrowing owl crossing" signs within 1km of nests located along roads, to reduce vehicular mortalities of owls.

The 297 observations of *At Risk*, *May be At Risk*, and *Sensitive* species in the K-blocks shows the importance of the area to native-grassland species. Future surveys of the K-blocks should continue to include these species, and results should be reported. Those data could be highly beneficial with respect to long-term population trend monitoring of these additional species. The methods employed in the K-block surveys since 1993 collected the same information as we did in this year's survey. Accordingly, an effort should be made to assemble that data and, where there is sufficient information, report trends in populations of these other species.

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